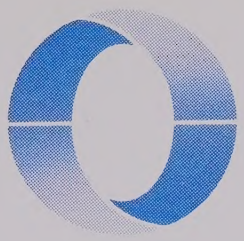

Macbeth®
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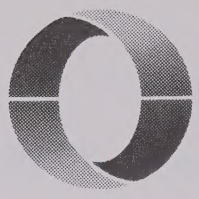
Photographic Color Analyzer PA-905

Operator's Manual



Macbeth
Division of
Kollmorgen Corporation

OPERATOR'S MANUAL
FOR
PHOTOGRAPHIC ANALYZER
MODEL PA-905

ISSUE DATE: OCT. 1971

FOREWORD

This manual has been prepared to enable you to enjoy optimum performance from your new Photographic Analyzer Model PA-905. This instrument has been developed to fill the need for an easy to operate, reliable, precision instrument for obtaining color and exposure information from enlargers or projection printing systems. The information set forth in this manual will serve you over the years, and the few minutes you invest now to acquaint yourself with its contents will reap rewards for you throughout the life of your PA-905.

This owner/operator manual contains the data, descriptions and specifications of the model described herein as they were in effect at the time the manual was approved for printing and as they have been changed to date. Consistent with the Macbeth Division's policy of continuous product improvement, it is possible that these data, descriptions and specifications may be changed in the future or that the model described herein may be discontinued. The Macbeth Division of Kollmorgen Corporation reserves the right to make such changes or to discontinue such model without notice, and any such change or discontinuance shall not give rise to any obligation or liability to any customer who purchased such model prior thereto. If the model described herein should be significantly changed or discontinued, we will announce such change or discontinuance by means of addenda, change notices or other similar methods. If you desire to receive these announcements, please notify us, stating the model, serial number and date of purchase of your equipment.

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PREFACE

Successful color printing depends on the ability of the darkroom technician to control or compensate for the variables inherent in color negatives and in photo-processing materials and equipment in order to produce consistent, satisfactory prints, negative after negative, without wasteful experimentation.

Variables encountered with photo-processing materials and equipment include: (1) characteristics, temperature, and age of processing chemicals; (2) emulsion characteristics of the print paper; (3) operating and performance characteristics of the enlarger. These variables are usually known, or are easily ascertained, and controlled to provide consistent photo-processing conditions. However, because of inherent density variations in each negative, enlarger adjustments are necessary on a negative-to-negative basis to insure the proper amount of filtration and exposure to produce a good print.

Photographic Analyzer PA-905 eliminates the trial-and-error approach to color printing; filtration and exposure-time determinations are obtained scientifically. By eliminating guess-work and the need to make test prints for each negative, the PA-905 reduces material costs and increases output.

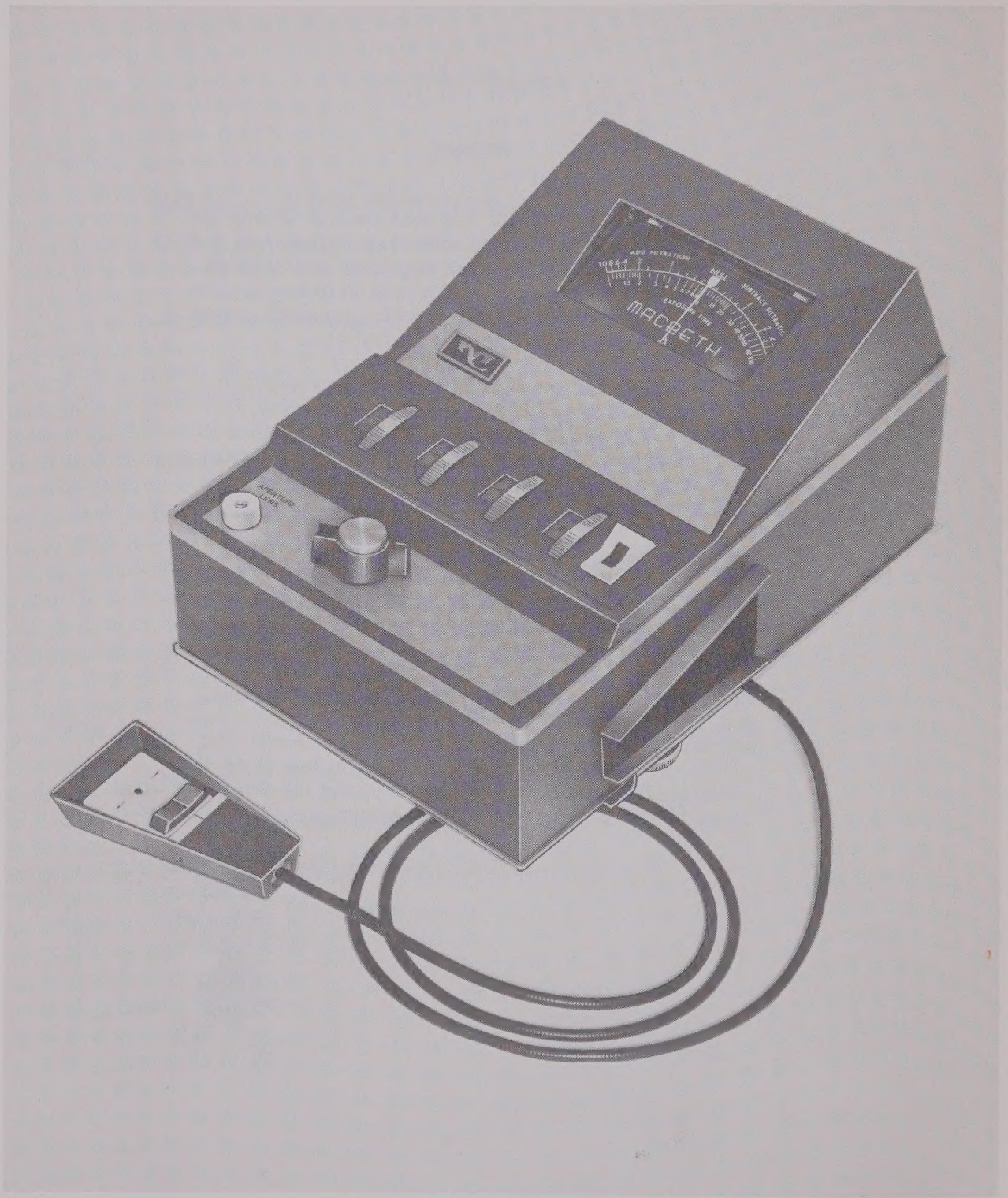


Figure 1-1. Photographic Analyzer, PA-905

SECTION 1

GENERAL INFORMATION

1-1 GENERAL DESCRIPTION

Photographic Analyzer PA-905 (figure 1-1) is an "on-easel" color/light measuring device that operates basically as a memory system and facilitates proper control of enlarger filtration (i.e. correction filters) and exposure time for color-negative printing. The PA-905 minimizes the complexity of color photographic printing and assures uniform tone values in the final product while requiring only the simplest of operator skills. The color balance and density of production prints made from negatives analyzed with the PA-905 will accurately reproduce the qualities of a satisfactory print made from a master negative to which the instrument is indexed.

1-2 APPLICATIONS

The PA-905 has been designed principally for use with commercial enlargers to analyze color negatives via tri-color (additive) or white-light (subtractive) exposure methods (see note below). A built-in electronic f-stop facilitates the use of the PA-905 with: (1) enlargers having click-stop lenses; (2) enlargers with optical-integration attachments for large-area readings.

NOTE

Because the tri-color exposure method is no longer popular in darkroom practice, only the white-light method is considered in this manual.

The PA-905 can also be utilized to maintain the color balance of motion-picture printers or in any other task requiring accurate memory or comparison of red, green, and blue light energies against a standard. If you wish to use the PA-905 in a special application and the proper method for its use cannot be ascertained or derived via a thorough understanding of the procedures provided in this manual, please contact Macbeth Division of Kollmorgen Corporation, Box 950, Newburgh, New York 12550. These inquiries should be directed to the attention of Technical Services.

1-3 ITEMS/ACCESSORIES SUPPLIED

The following items/accessories are supplied with the PA-905.

a. One operator's manual

b. Warranty statement

c. Simple operating instructions (enclosed in transparent envelope)

d. Large-area (6-mm) accessory lens.

SECTION 2

INSTALLATION

2-1 INPUT POWER

The PA-905 will operate on either 115 or 230 vac, at power-line frequencies of 50 and 60 Hz respectively. Change from 115 vac to 230 vac operation (or vice versa) is accomplished via the 115/230 selector switch located on the underside of the instrument chassis. Total power consumption is approximately 17 watts.

CAUTION

Make certain that: (1) the 115/230 selector switch is set at the proper position for available input power; (2) the proper fuse is installed for available input power (see table 4-2).

2-2 VOLTAGE REGULATION

The electronic power supply of the PA-905 is self-regulated, hence normal line-voltage variations will have negligible affect upon the instrument and external voltage regulators are not required.

SECTION 3

OPERATING INSTRUCTIONS

3-1 PRELIMINARY CONSIDERATIONS

a. OPERATOR EXPERIENCE. - It is assumed that the operator has a basic knowledge of color printing techniques and the effects of color printing filters and their uses. For additional reference material, the reader is referred to Kodak pamphlet E-52 entitled "Evaluating Color Negatives" and Kodak pamphlet E-66 entitled "Printing Color Negatives."

b. TRICOLOR VS. WHITE-LIGHT EXPOSURE METHODS. - The PA-905 can be used for both exposure methods. However, if the tricolor method is used, specific exposure times for the red, green, and blue exposures must be recorded. For the white-light method, the exposure time and the specific set of color-compensating filters (i.e. filter pack) must be recorded. Because of its popularity, only the white-light exposure method is considered in this manual.

c. MASTER NEGATIVES AND PROGRAMMING DATA. - The PA-905 operates basically as a memory system that aids in achieving reproductibility. Because the PA-905 is a memory device, quality of performance is dependent upon the programming data employed in setting up the PA-905 and the enlarger being used. To obtain this data, it is necessary to make (by trial and error) a satisfactory print from a normal negative and carefully record: (1) enlarger settings (magnification, f-stop); (2) filters used; (3) exposure time; (4) paper factors. The negative for which the instrument is programmed (i.e. indexed) will hereafter be called a "Master Negative" and it should be preserved for future reference.

d. SPOT READINGS VS. INTEGRATED READINGS

(1) GENERAL. - Using the PA-905 with either method is simple and accurate and the procedures are basically the same. Integrated readings, however, require the use of an integrating attachment (such as the EA-50B) which contains, essentially, a "scrambling lens" that is mounted on the enlarger. Information pertaining to the EA-50B Optical Integrating Assembly and its installation is given in the supplement to this manual.

(2) CHOOSING PROPER METHOD. - Although spot readings will usually provide more accurate results, integrated readings are useful when the negatives do not contain any reliable reference areas suitable for spot readings. Some negatives, however, do not lend themselves to the integration method and poor prints result due to "subject failure." Such negatives contain large areas of one predominant color, intentional light or dark areas, large sky areas, high key shots, etc. The successful use of the integration method is dependent on one's ability to classify negatives according to the most appropriate method for evaluation. For further information on this subject, refer to Kodak pamphlet E-52 entitled "Evaluating Color Negatives."

(3) EXPOSURE DETERMINATIONS VIA INTEGRATED READINGS. Exposure determinations can be obtained via integrated readings; however, the following conditions must be met.

(a) The master negative and production negatives must be exactly the same size.

(b) Magnification of the master negative and production negatives must be exactly the same.

(c) The enlarger f-stop must be exactly the same for the master negative and production negatives.

NOTE

The same method (i.e. integrated reading or spot reading) for exposure determination must be used both when indexing the PA-905 to a master negative (paragraph 3-3b) and when analyzing production negatives (paragraph 3-3c).

3-2 OPERATING CONTROLS AND INDICATORS

Before using the PA-905, familiarize yourself with the location and function of each control and indicator. Refer to table 3-1 and figure 3-1.

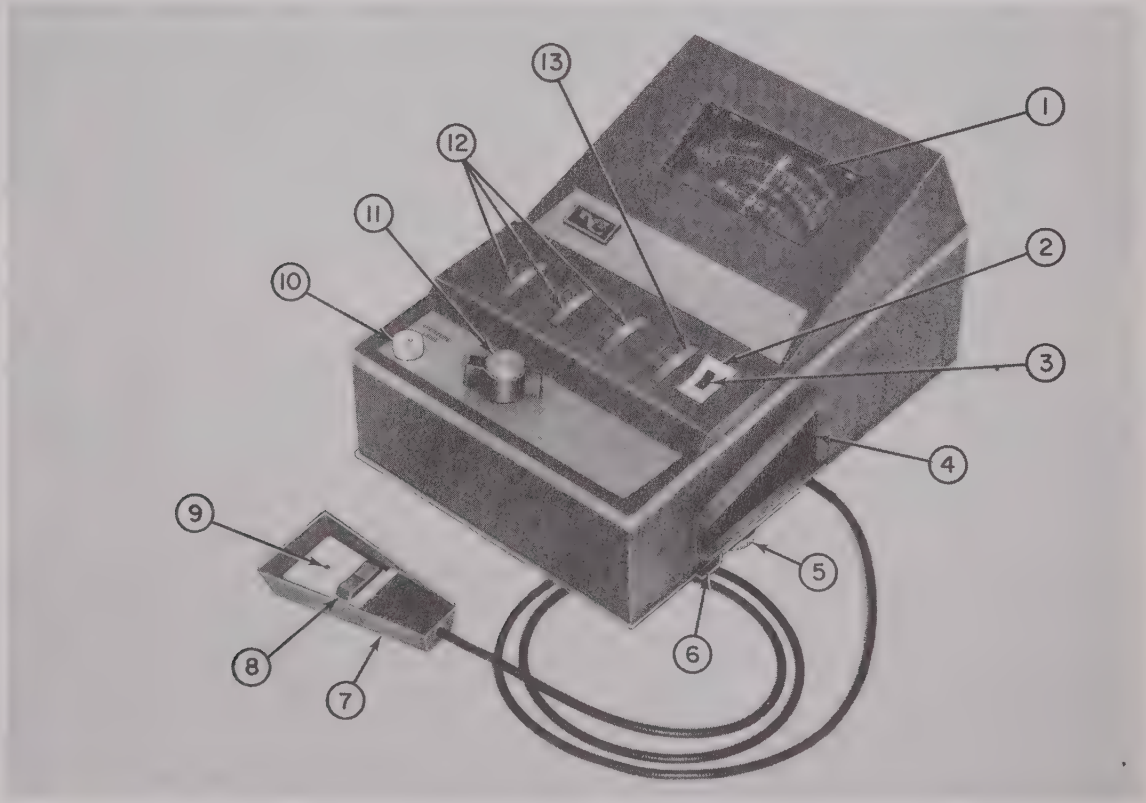


Figure 3-1. Controls and Indicators, PA-905

TABLE 3-1. OPERATING CONTROLS AND INDICATORS

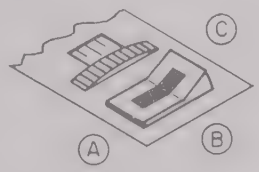
ITEM NO. (FIG. 3-1)	CONTROL/INDICATOR DESIGNATION	FUNCTION
1	Meter	Upper Scale (correction filter requirements) - scale is divided into 6 major divisions (0.1, 0.2, 0.4, 0.6, 0.8, 1.0) on either side of center-reading Null area: each 0.1 division can be interpreted as being approximately equal to a Kodak CC10 filter; meter markings clearly indicate whether filtration should be added or removed for color negative printing. Meter readings from Null to 0.1 (in either direction - left or right) are accurate within $\pm$.01. Meter readings from 0.1 to 1.0 are accurate within 15 percent. Lower Scale (Exposure Time) - direct-reading scale; easy-to-read divisions from 1 to 100 seconds increasing from left to right.
2	On/Off Switch	Three position rocker switch; synchronized with Selector Switch (11) and Pilot Light (3). Position A, (OFF): Instrument is turned off; red pilot light (3) is lit. Position B, (ON): Instrument is turned on; red pilot lamp (3) is off; selected attenuator dial lamp is lit.  Position C, (ON): Same as position B, but all attenuator dial lamps are lit.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS (Cont.)

ITEM NO. (FIG. 3-1)	CONTROL/INDICATOR DESIGNATION	FUNCTION
3	Pilot Lamp	Lamp is lit only when instrument is turned off and plugged into appropriate power source - aid in locating On/Off switch (item 2) during darkroom operation.
4	Cradle	Probe should be stored here when not in use.
5	Electronic f-Stop	Adjusts sensitivity of instrument. Used also to shift meter readings when: (1) using enlargers that have click-stop lenses; (2) making integrated readings.
6	Attenuator Brake	When pushed downward toward rear of instrument the four attenuator dials are friction locked in place. When pulled upward (i.e. in horizontal position), attenuator dials are released and can be rotated.
7	Probe	Houses light-collecting fiber optics; facilitates placement of Target Spot (item 9) exactly where desired in image area.
8	Target Adjust Control	Adjustment provides cosine correction so that optical alignment of probe with enlarger lens can be obtained anywhere on enlarger easel.
9	Target Spot	3-mm target spot enables highly selective and precise readings.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS (Cont.)

ITEM NO. (FIG. 3-1)	CONTROL/INDICATOR DESIGNATION	FUNCTION
10	Aperture Lens	6-mm aperture lens fits in place and is held magnetically over 3-mm Target Spot (item 9) for large-area readings.
11	Selector Switch	Rotation of switch so that it points at one of four attenuator dials (item 12 or 13) inserts: (1) the associated attenuator into the instrument electronics and (2) the associated filter into the instrument optical system. At the same time, the color-coded attenuator dial lamp is lit when On/Off Switch (item 2) is set at position B.
12	Red, Green, Blue Attenuators	Each Attenuator corresponds with a red, green, or blue filter. The red filter measures cyan filtration; the green measures magenta, and the blue measures yellow filtration. Attenuators are used to adjust Meter for "Null" indication when indexing PA-905 to master negative for color filtration.
13	White Attenuator	Adjusts Meter for exposure-time indication when indexing analyzer to master negative.

3-3 OPERATING PROCEDURES

a. GENERAL. - Operating procedures for the PA-905 are separated into two basic stages: (1) first, the analyzer is indexed (i.e. programmed) to a master negative and the enlarger set-up conditions that provided a satisfactory print (refer to paragraph 3-1c); (2) once indexed, the PA-905 is used to make enlarger adjustments (with production negatives) that duplicate the printing characteristics of the master negative that produced the satisfactory print. During each stage of operation, two sets of criteria are considered; (1) color composition of the light striking the color print paper (i.e. color balance) (2) amount of light striking the color print paper (i.e. exposure). Depending on the characteristics of the negative, one of two types of readings (spot readings or integrated readings) can be used for either set of criteria (refer also to paragraph 3-1d). It is important to note, however, that the same type of reading must be used when indexing the analyzer and when analyzing negatives. For example, if spot readings are used for color balance when indexing the analyzer, then spot readings must be used for color balance when analyzing negatives. Note also that regardless of what type of reading is used for color balance, spot readings are generally employed for exposure determinations.

b. INDEXING ANALYZER TO MASTER NEGATIVE. - Proceed as described below.

NOTE

For enlargers equipped with an optical integrating attachment, the integrating lens must be: (1) swung out of the enlarger light beam for Spot Readings, or; (2) swung into the enlarger light beam for Integrated Readings.

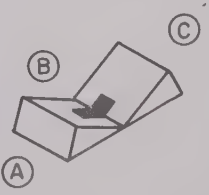
(1) Make certain that 115/230 vac Switch on underside of PA-905 is set at proper position for available a-c input power.

NOTE

Numbers enclosed in circles are items appearing in figure 3-1.

(2) Select 3-mm or 6-mm reading area. The Target Spot (9) of the basic Probe has 3-mm diameter. An accessory 6-mm lens is provided for extreme enlargements, low light levels, and/or special applications.

(3) Set On/Off Switch (2) at middle position (position B); only one Attenuator dial will be lit.



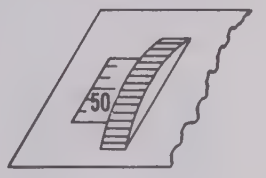
NOTE

The PA-905 is designed for operation on a short duty-cycle basis; optimum performance will be realized if the instrument is turned off when ever it is not in actual use.

(4) Place master negative and master filter pack (refer to paragraph 3-1c) in enlarger. Turn enlarger on and make certain that enlarger set up (filtration, magnification, and f-Stop) is identical to that which produced satisfactory print.

(5) Place Probe (7) on enlarger easel so that desired point (i.e. reference area - gray scale, flesh tone, etc) of projected image falls on Target Spot (9) of Probe. For integrated readings, place Probe in center of projected spot. Note: successful color printing depends on one's ability to select the right reference area (refer also to paragraph 3-1d).

(6) Insure that Attenuator Brake is released and rotate Selector Switch (11) to Red Attenuator (12). Pre-set Red Attenuator at 50 (see note below).



NOTE

50 has been established as an arbitrary setting for the Red Attenuator in a typical printing situation using flesh tone as a reference. It may be necessary to select a setting other than 50 for printing situations wherein unusually high or low light levels are experienced.

(7) Refer to figure 3-2, if Probe is not directly under enlarger lens, make sure that one of the arrows on the Probe face points toward the enlarger lens axis (immaginary line projecting from the easel and passing through the center of the enlarger lens). Adjust Target Adjust Control (8) as required to obtain maximum left deflection on Meter scale.

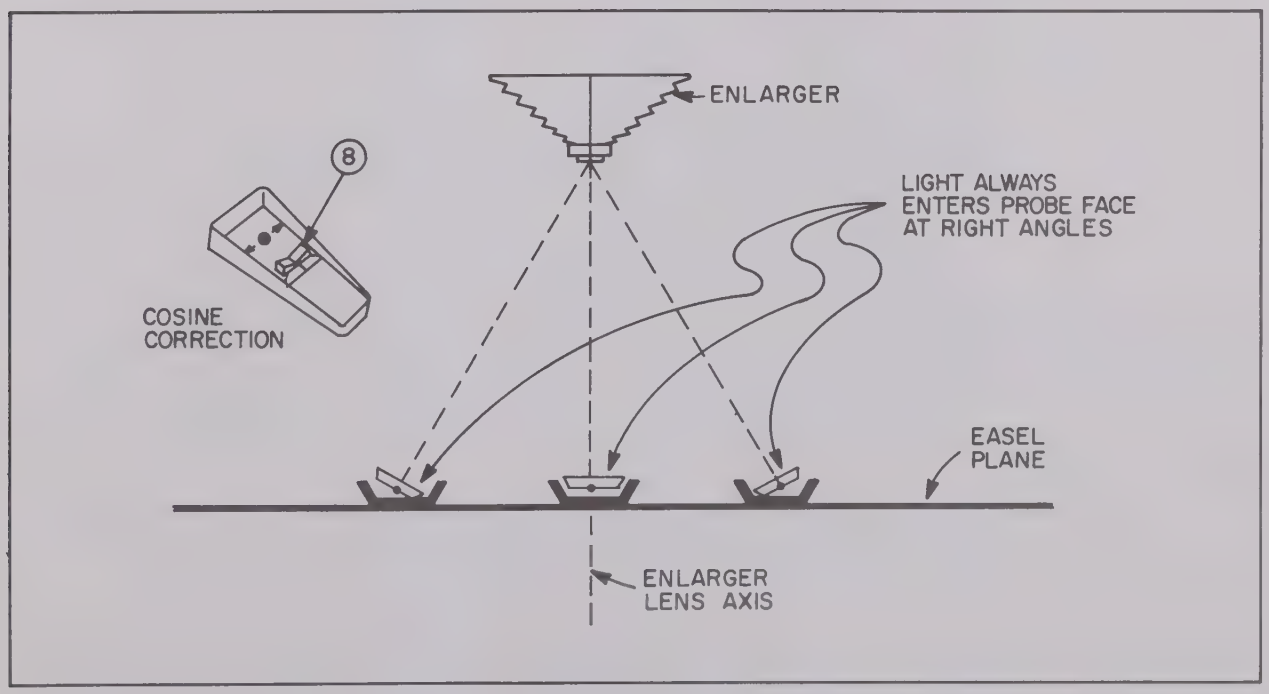


Figure 3-2. Optical Alignment of Probe

(8) With Selector Switch set at Red Attenuator, adjust Electronic f-Stop (5) to obtain "Null" indication on Meter (1). In some cases, when the PA-905 cannot be "Nulled" with the Electronic f-Stop the Red Attenuator may be set at a value other than 50 or the enlarger lens diaphragm may be adjusted. Once established, the setting of the Electronic f-Stop should not be changed during step (9) of this procedure.

NOTE

Adjustments made with Red Attenuator (12) merely establish PA-905 sensitivity at the proper level and have nothing to do with cyan filtration.

Most color-negative films contain an orange masking layer and when printed on color paper, they require a light of reddish color (i.e. a mixture of magenta and yellow in varying amounts). Consequently, cyan filtration is rarely if ever, used. However, cyan filtration is used sometimes instead of magenta or yellow when making duplicate transparencies. In no case should all three filters (cyan, magenta, and yellow) be used, since this results in neutral density and only increases exposure.

(9) Rotate Selector Switch (11) to Green and Blue Attenuator (12). Adjust each Attenuator as required to obtain "Null" indication on Meter (1). If "Null" indication cannot be obtained, Red Attenuator may be set at different starting value (see step (6) above).

(10) Recheck Red, Green, and Blue Attenuator positions to make sure that Meter is "Nulled" in all positions.

NOTE

In step (11) below, if integrated readings are used there may be too much light to provide correct exposure indications (i.e. obtainable indications are too low; Meter needle is to left of desired point). In these cases, place a piece of neutral-density film over the Target Spot (9) of the Probe (7).

(11) Rotate Selector Switch to White Attenuator (13), and adjust White Attenuator as required until Meter (1) indicates exposure time used to obtain satisfactory print with master negative.

(12) Press Attenuator Brake (6) downward (towards rear of instrument) to lock Attenuators in position.

(13) Set On/Off Switch (2) at forward position (position C) to light dial lamps of all Attenuators. Note and record Attenuator settings for future use.

NOTE

For your convenience, a typical log sheet is provided in the supplement to this manual.

c. ANALYZING PRODUCTION NEGATIVES. - Because of normal variations in printing characteristics between production negatives and the master negative, it is necessary to compensate for these differences via filtration and exposure adjustments in the enlarger set up. Once the PA-905 has been indexed to a master negative (paragraph 3-3b) proper color balance and exposure can be achieved as outlined below.

NOTE

It is assumed that processing conditions and color paper emulsions are the same as those used to obtain a satisfactory print from the master negative. For information on quality control (process monitoring) of processing solutions, contact Macbeth Division of Kollmorgen Corporation.

The aperture size and the method (i.e. Spot Readings or Integrated Readings) that were used to index the PA-905 (paragraph 3-3b) must also be used during this procedure. Refer also to the note at the beginning of paragraph 3-3b.

(1) Place production negative and filter pack (equivalent of master filter pack - paragraph 3-1c) in enlarger. Set up enlarger so that negative is enlarged, cropped as desired, and focused.

NOTE

Numbers enclosed in circles are items appearing in figure 3-1.

(2) Set On/Off Switch (2) of PA-905 at forward position (position C); all Attenuator dials should be lit. Note that the PA-905 is designed for operation on a short duty-cycle basis; optimum performance will be realized if the instrument is de-energized whenever it is not in actual use.

(3) Make certain that Attenuator Brake (6) is released; then set Attenuators (12) and (13) at values recorded when PA-905 was indexed to master negative (paragraph 3-3b). Press Attenuator Brake (6) downwards (to the rear) to lock Attenuators in position.

(4) Set On/Off Switch (2) at middle position (position B); only one Attenuator dial lamp will remain lit. Rotate Selector Switch (11) to Red Attenuator (12).

(5) Place Probe on enlarger easel; position Probe so that reference area of projected image falls on Target Spot (9) of Probe (7). Note that the reference area of production negative must be identical to reference area of master negative (see note below).

NOTE

Because of density variations from point to point within the same color, take care to locate the identical point on the master negative and the production negative when indexing and analyzing respectively.

(6) Refer to figure 3-2. If Probe is not directly under enlarger lens, make sure that one of the two arrows on the Probe face points towards enlarger lens axis. Rotate Target Adjust control (8) as required to obtain minimum indication (maximum left deflection on "Exposure Time" scale of Meter (1)).

NOTE

Step (7) below merely establishes instrument sensitivity at the proper level and has nothing to do with cyan filtration.

(7) Rotate Selector Switch (11) to Red Attenuator (12) ; adjust Electronic f-Stop (5) so that "Null" indication is obtained on Meter (1) .

NOTE

The setting of the Electronic f-Stop should not be changed during steps (8) and (9) of this procedure.

(8) Rotate Selector Switch to Green Attenuator. Adjust magenta filtration of enlarger so that "Null" indication is obtained on instrument meter.

(9) Rotate Selector Switch to Blue Attenuator. Adjust yellow filtration of enlarger so that "Null" indication is obtained on instrument meter.

(10) Repeat steps (7), (8), and (9) and make certain that Meter (1) indicates "Null" for Red, Green and Blue Attenuators.

NOTE

In step (11) below; if integrated readings are used and neutral density was placed on the Probe during indexing, the same neutral density must be used for analyzing.

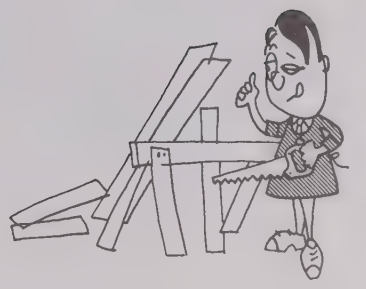
(11) Rotate Selector Switch to White Attenuator (13) and adjust enlarger lens diaphragm so that Meter (1) indicates exposure time required to obtain satisfactory print from master negative. This reading should correspond with reading established in step (11) of Indexing procedure (refer to paragraph 3-3b). Note: Adjustment of the enlarger lens diaphragm will yield other exposure-time indications that can be used except if the integration attachment is in place. However, if possible, exposure time should be kept constant to avoid reciprocity failure.

(12) Set On/Off Switch (2) at position A; reset enlarger timer if necessary, and expose color print paper.

SECTION 4

OPERATOR'S MAINTENANCE

4-1 GENERAL



Operator's maintenance consists of routine visual inspection and cleaning (i.e. good housekeeping) and replacement procedures that can normally be achieved at the operating location without the use of special tools and/or skills.

4-2 INSPECTION AND CLEANING

Dust, dirt, moisture, and other destructive environmental elements can contribute to equipment failure; therefore, the unit should be inspected and cleaned periodically. The frequency of this inspection and cleaning should, of course, be dependent upon: (1) frequency of instrument usage; (2) environmental operating conditions. Refer to figure 4-1 for component location, and proceed as follows:

a. Ensure that linecord of PA-905 is disconnected from a-c power source. Carefully set instrument on its left side (i.e. side without probe cradle); loosen and remove four corner screws securing instrument cover to chassis.

b. Set instrument upright. Using #8 Allen wrench, loosen two set screws securing knob of Selector Switch to shaft and remove knob.

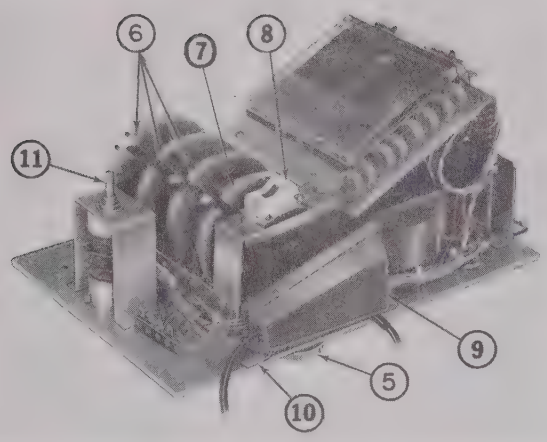
c. Carefully lift instrument cover from chassis and set cover aside. Inspect wiring and all components for dust, dirt, moisture corrosion, discoloring, or grease. Dust should be removed with a soft brush or vacuum cleaner; dirt or grease should be removed from all components except the P/C boards with any suitable cleaning solvent. P/C boards should be cleaned only with a dry brush.

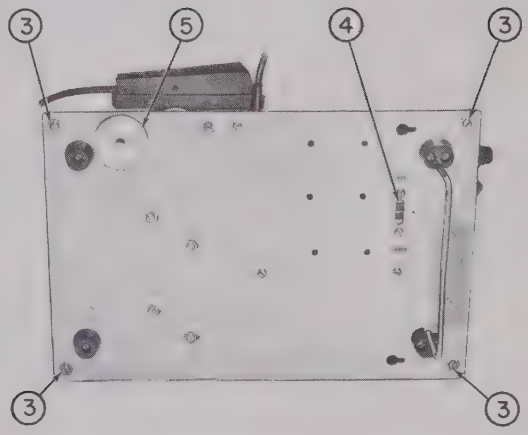
CAUTION

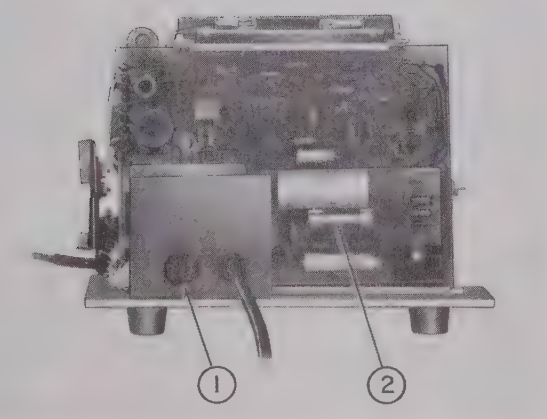
Use of carbon tetrachloride should be avoided because of its highly toxic effects. If using trichlorethylene, avoid contact with painted surfaces due to its paint-removing effects.

CAUTION

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents should not be used on energized equipment from which a spark may be received. Smoking, "hot work," etc. should be prohibited in the immediate area.







1. FUSE F501
2. FUSE F201
3. COVER RETAINING SCREWS
4. 115/230 VAC SWITCH
5. ELECTRONIC f-STOP
6. RED/GREEN/BLUE ATTENUATOR
7. WHITE ATTENUATOR
8. ON/OFF SWITCH
9. PROBE
10 ATTENUATOR BRAKE
11. SELECTOR SWITCH

Figure 4-1. Component Location, PA-905

d. Reassemble all components in reverse order of disassembly (steps a through c above). When replacing photomultiplier tube, take care that tube is seated properly in socket and does not touch magnetic shield.

e. Inspect Target Spot of instrument probe for accumulation of dirt or dust, clean Target Spot with lens brush or lens tissue.

NOTE

After cleaning, the PA-905 should be re-indexed for all printing conditions.

4-3 FUSE REPLACEMENT

There are two fuses employed in the PA-905: (1) fuse F501 located on the rear chassis panel of the instrument; (2) fuse F201 located on the printed circuit board for the power supply. No special instructions are required to replace either fuse; however, in order to gain access to fuse F201, it is necessary to first remove the instrument cover (refer to steps a, b, and c of paragraph 4-2). Indications of a burned-out fuse are given in table 4-1; replacement fuses must comply with the information given in table 4-2.

TABLE 4-1. BURNED-OUT FUSE INDICATIONS

INDICATION	FUSE
Meter lamps and dial lamps do not light and readings cannot be obtained on Meter when On/Off Switch is set at either of two "on" positions (refer to table 3-1).	F501
Meter lamps and dial lamps light but Meter is pegged downscale (i.e. at left side of Meter). Adjustment of attenuators or or Electronic f-Stop have no effect on Meter.	F201

TABLE 4-2. FUSE-REPLACEMENT DATA

FUSE	RATING	DESCRIPTION
F501		
-110 vac Operation	1/4 amp 250 V	#3AG, 1/4 in (6mm) x 1-1/4 (32mm), cartridge, Slo-Blo (Macbeth Part #31002000)
-220 vac Operation	1/8 amp 250 V	Same as above (Macbeth Part #31001001)
F201	1.0 amp 250 V	Same as above (Macbeth Part #31010000)

CAUTION

Do not replace a fuse with one higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.

4-4 LAMP REPLACEMENT

Lamps employed in the PA-905 are operated at below rated voltage; therefore, the lamps are expected to last a long time. When and if replacement becomes necessary, proceed as outlined in paragraph a or b below.

a. REPLACING METER LAMP.

(1) Refer to steps a, b, and c of paragraph 4-2 and remove instrument cover from chassis.

(2) Using long-nose pliers or tweezers, carefully lift lamp from socket: meter lamp is "midget grooved" type and no twisting action is required.

(3) Place new lamp (GE #386, 14v, 0.80 amp - Macbeth Part #20014001) in socket and apply light force to seat lamp in socket.

(4) Reassemble instrument cover and chassis in reverse order of disassembly.

b. REPLACING ATTENUATOR LAMP.

(1) Refer to steps a, b, and c of paragraph 4-2 and remove instrument cover from chassis.

(2) Rotate attenuator with burned out lamp to point where cutout of plastic dial is positioned over lamp.

(3) Using long-nose pliers or tweezers, carefully lift colored lamp cap off of lamp; lamp cap is held in place by force fit. Set cap in safe place.

(4) With long-nose pliers or tweezers, lift lamp out of socket; lamp is "midget grooved" type and no twisting action is required.

(5) Place new lamp (GE #386, 14v, 0.80 amp - Macbeth Part #20014001) in socket and apply light force to seat lamp in socket. Replace colored lamp cap.

(6) Reassemble instrument cover and chassis in reverse order of disassembly.

FOR YOUR CONVENIENCE

We've bound this over-sized envelope into your Manual. In addition to providing a protected storage spot for the accessories of your instrument, it will be a handy place for you to keep all of the records and standards which you'll want to save for future reference.

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